Endurance and strength training have different benefits for people with peripheral arterial disease, but both improve quality of life

Synopsis

Summary of: McDermott MM, Ades P, Guralnik JM (2009) Treadmill exercise and resistance training in patients with peripheral arterial disease with and without intermittent claudication: a randomized controlled trial. *JAMA* 301: 165–174. [Prepared by Mark Elkins, CAP Co-ordinator.]

Question: Do treadmill training and resistance training improve the functional performance of patients with peripheral arterial disease (PAD)? ***Design***: Randomised, controlled trial with blinded outcome assessment and stratification for symptoms of intermittent claudication (IC). ***Setting***: Tertiary hospital in the USA. ***Participants***: Participants with an ankle brachial index of 0.95 or less were recruited from vascular clinics and the community. Key exclusion criteria were critical limb ischaemia, foot ulcers, amputation, inability to attend or perform the interventions, and usual exercise comparable to the study regimens. Randomisation of 156 participants allotted 51 to treadmill training, 52 to resistance training and 53 to a control group. ***Interventions***: The treadmill group performed supervised treadmill exercise 3 times per week for 6 months. Participants aimed to increase to 40 minutes by week 8, after which the speed or grade of the treadmill was progressed. Participants with IC were encouraged to exercise to near maximal leg symptoms. Asymptomatic participants exercised at a perceived exertion of 12 to 14 on the Borg scale. The resistance group also performed supervised exercise 3 times per week for 6 months, including 3 sets of 8 repetitions of resisted lower limb exercises. External resistance was maintained above 50% of 1 repetition maximum and perceived exertion at 12 to 14. The control group attended 11 sessions that were designed to provide contact with a health professional but not to change behaviour. ***Outcome measures***: The primary outcomes were the change in the six-minute walk test (6MWT) and the short physical performance battery (SPPB) at 6 months. The SPPB assesses walking speed, balance, and sit-to-stand performance. Secondary outcome measures were treadmill endurance, lower limb strength, endothelial function measured non-invasively at the brachial artery, habitual physical activity measured over 7 days via an accelerometer, a walking impairment questionnaire (WIQ), and the SF-36 quality of life questionnaire. ***Results***: Compared to control, treadmill training significantly improved 6MW distance (by 36 m, 95% CI 15 to 57), total treadmill time (by 3.4 min, 95% CI 2 to 4.8), pain-free treadmill time (by 1.6 min, 95% CI 0.3 to 2.9), endothelial function, and the Distance domain of the WIQ. Compared to control, resistance training significantly improved total treadmill time (by 1.9 min, 95% CI 0.5 to 3.3), knee extension strength (by 80 N, 95% CI 37 to 124), and the Distance and Stair Climbing domains of the WIQ. Both regimens produced significant, 7.5-point improvements in the Physical Functioning domain of the SF-36. ***Conclusion***: Treadmill and resistance training have different benefits for people with peripheral arterial disease, but both improve quality of life.

Commentary

Previous studies of exercise for PAD have focused on patients with IC. In this study, patients without IC were also included and randomisation was stratified to ensure an even proportion was allocated to each treatment group. This strongly suggests that one premise of this study was to compare the effect of training on PAD patients with IC versus those without IC. The authors report only that these groups had 'reasonably similar' outcomes, stating that the trial was underpowered for this comparison to be made statistically. This may be because fewer than 20% of the participants had IC. Nevertheless, the high proportion of participants without IC provides welcome data about this under-investigated group.

Follow-up for the primary analysis was excellent at 92%. Some secondary outcomes had substantially lower follow-up, ranging from 56% to 88%. Although this creates a source of error in the results, sensitivity analyses suggest that the missing data were not grossly atypical.

Specificity of training was clearly evident. Treadmill training significantly improved walk-based outcomes, whereas the effects of resistance training were non-significant or lesser. Conversely, only resistance training significantly improved strength-based outcomes. Despite these differences, the size of the effect on quality of life related to physical function was the same for the two regimens.

Clinically worthwhile improvements in six-minute walk distance have not been established in patients with PAD, unlike chronic obstructive pulmonary disease (COPD). The improvement in the treadmill training group of this cohort (20 m), while statistically significant, is less than the improvement considered clinically worthwhile in moderate to severe COPD patients (35 m) (Puhan et al 2008). As a result, it is difficult to state that the improvement in six-minute walk distance was clinically significant in PAD patients.

The results of this study suggest that clinicians can train patients with PAD and physical limitation, regardless of the presence or absence of symptoms of IC. Furthermore, due to specificity of training, clinicians can prescribe the modality of exercise that more closely targets the specific problems of the individual patient, rather than a 'one modality fits all' approach.

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References

Puhan M et al (2008) *Eur Resp J* 32: 637–643.